

White Paper
Intel® Itanium® Processor
Data Center Migration
Business-Critical
Infrastructure

Transforming Business-Critical Infrastructure through Migration to Itanium®-Based Servers

A Decision-Maker's Guide to the Benefits, Challenges, and Available Resources

Large businesses around the world are migrating mission-critical applications to Itanium-based systems to achieve the highest levels of scalability and availability, without the high costs and limitations of proprietary architectures.



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Executive Summary

“The new [Itanium-based] platform gives us the tools and technology to solve our complex IT problems and succeed in this competitive industry.”

— Simeon Dimitrov, *Department Manager,
IT Resources and Administration, Mobiltel AD*¹

Itanium®-based servers are changing the face of business-critical computing by delivering enterprise-class scalability and availability on an industry-standard computing architecture that is more flexible and affordable than proprietary RISC and mainframe architectures. The broad choice of vendors, operating systems, and applications provides a solid foundation for integration, and enables core enterprise applications to be scaled well beyond the limits of legacy technologies. Large businesses around the world are migrating to Itanium-based systems,² and finding that the move helps to free them from the limitations of proprietary architectures, while improving the economics of their data centers in fundamental ways.

The flexibility and scalability of Itanium-based servers make them ideal for:

- Scaling up existing Linux* and Windows* applications to handle heavier workloads, more users, and multi-terabyte datasets.
- Replacing aging RISC-based systems with Itanium-based systems (running UNIX*, Windows, or Linux) to increase performance and availability, while reducing costs.
- Modernizing proprietary mainframe environments to reduce costs and enable easier integration with new applications.

Since Itanium-based systems integrate easily with Intel® Xeon® processor-based servers, organizations can mix and match these two industry-standard server architectures to achieve the best total value across all their applications. New tools and resources have emerged that make migration to both architectures relatively easy. In many cases, legacy UNIX applications can run without substantial change, and can be managed and maintained using familiar tools and interfaces. Software migrations can then be conducted incrementally, with critical code being ported based on specific cost, benefit, and risk analyses. Proven tools and methods are available for software porting, and in some cases can reduce traditional porting efforts by as much as 90 to 95 percent.

This paper can help you assess the potential value of an Itanium-based server migration in your particular environment. It can also help you to begin planning your migration, and direct you to resources that will simplify your move and reduce your risk.

¹ Source: “Mobiltel Gears for Growth”, an Intel case study: www.itaniumsolutions.org/attachment/resource_media/B4F35B3A-F9A6-3D56-A67F0429687091B4.pdf

² Adoption of Itanium-based servers continues to increase rapidly. The volume of Itanium-based systems shipped increased 40 percent year-over-year from Q2'06 to Q2'07, while total system revenue increased 30 percent over the same period. Source: IDC WW Quarterly Server tracker, August 2007.

Constant Change: A Fact of Life in Enterprise IT

“...there are strong reasons for IT organizations to continue migrating servers away from proprietary UNIX platforms.”

– Driving Lower TCO and Rapid ROI through UNIX Migrations, Mercer Management Consulting, May 2006³

Change is a fact of life in enterprise IT. Mergers, acquisitions, and the natural evolution of the marketplace lead to continual and often unpredictable changes in business requirements. At the same time, workloads grow, new technologies emerge, and legacy solutions age, becoming more difficult to adapt and more costly to maintain (see the sidebar, *Tools of Legacy Software Modernization in Appendix B*).

The complexity and importance of enterprise computing solutions ensure that any path forward involves costs, risks, and challenges. They also ensure that there is no one-size-fits-all solution, because every business has different assets and requirements. Yet despite these differences, the basic goals remain similar across all businesses:

- Maximize the current value of IT assets.
- Focus on upgrades and migrations that deliver clear ROI.
- Do this while mapping a smooth path to increasing IT capability, flexibility, and cost-effectiveness.

Balancing these three requirements is always challenging. Yet the businesses that do it most effectively achieve a key competitive advantage. They stay ahead of their competition in IT capability, while continually optimizing the total return on their IT investments.

Migration Benefits Continue to Grow

According to IDC data, Itanium®-based servers represent the fastest growing server architecture in the world today[†]. With Intel's strong processor roadmap, this momentum can be expected to continue for many years to come.

1. **Tukwila**, a quad-core processor, will be equipped with more than two billion transistors and can be expected to deliver more than double the performance (based on typical system performance benchmark projections) versus today's Intel® Itanium® processors. It will also include the Intel® QuickPath Architecture, a new system architecture that will help increase the performance of future generations of multi-core Intel Itanium (and Intel® Xeon®) processors. Tukwila processor shipments will ramp in 2009, and systems for IT evaluation and software certifications (seed units) will be available in the first part of the year.
2. **Poulson**, a many-core version that will be manufactured on Intel's 32nm processor technology, will take parallel throughput (and overall performance) to new heights.
3. **Kittson**, currently in definition, can be expected to deliver additional major gains in performance, reliability and flexibility.

For more information, see the white paper, *Intel® QuickPath Architecture*: www.intel.com/pressroom/archive/reference/whitepaper_QuickPath.pdf

[†]Source: IDC Worldwide Server Tracker, Q4'08

³ Available at: www.migrationforunix.com/futureproof/downloads/mercer-white-paper.pdf

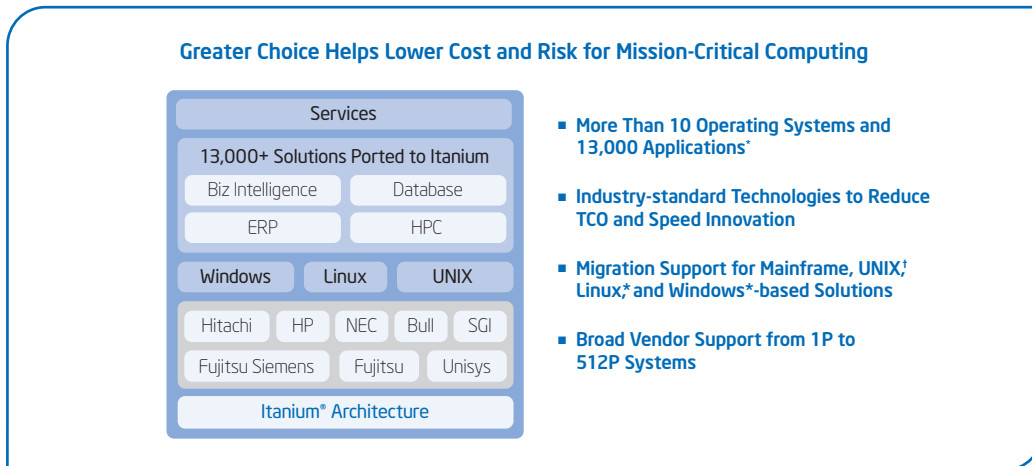


Figure 1. Itanium®-based solutions are bringing choice, flexibility and affordability to mission-critical computing, and have enabled tens of thousands of companies to free themselves from the costs and limitations of proprietary RISC and mainframe architectures.

[†]Source: Itanium Solutions Alliance

Answering the Challenge with Itanium®-based Solutions

“... Intel Itanium processors provide new alternatives for buyers of high-end servers and free them from the constraints of proprietary RISC architectures⁴.”

Large businesses have long relied on proprietary RISC and mainframe architectures to deliver the high-end scalability and availability needed for business-critical solutions. Those architectures have delivered, but at high cost and with a loss of flexibility and choice due to vendor and technology lock-in.⁵ In today's faster and more demanding business environment, that lack of flexibility can be a serious roadblock to business innovation.

Itanium-based systems present a unique opportunity in the history of IT – an affordable, standards-based alternative that meets the most demanding performance, scalability, and availability requirements. These servers support more than 10 operating systems (Windows, Linux, UNIX, z/OS,^{*} etc.⁶) and over 13,000 certified applications.⁷ They are supported in turn by a rich, global community of hardware vendors, software developers, and service providers (Figure 1). In combination with Intel Xeon processor-based servers, they provide organizations with end-to-end support for running all their business applications on industry-standard servers.

This flexibility and broad support can be a key advantage in infrastructure modernization, making it easier to integrate new solutions and upgrades. Customers can migrate incrementally and strategically, they can achieve faster ROI, and they can increase their options and cost-effectiveness going forward. Thousands of companies have already moved to Itanium-based solutions, and the value of migration continues to increase (see the sidebar, *Migration Benefits Continue to Grow on the previous page*).

⁴ Source: “Intel® Itanium® 2: The Key to Choice in IT Infrastructure,” An Insight 64 White Paper Sponsored by the Itanium® Solutions Alliance, September 15, 2006. www.itaniumsolutions.org/attachment/resource_media/6BCF7006-BBF4-93C9-FD8B1B21A6F2480D.pdf

⁵ “...because most of the leading UNIX operating systems are tied to specific lines of server hardware, many users of these systems are finding that their limited deployment options are becoming increasingly burdensome.” Source: “Migrating Business-Critical Applications from UNIX to Windows and Itanium® 2-based Servers,” by Ideas International, January 2006. www.itaniumsolutions.org/attachment/resource_media/6BE0A04B-9D4E-200F-4B071BD5518C7A1D.pdf

⁶ According to a Forrester Research report, in choosing a strategic system architecture, IT organizations should: “Give a higher weighting to server systems architectures that can equally run applications workloads across a wider breadth of operating system choices—most notably Linux (predominantly Red Hat or SuSE), Windows 2003, and an incumbent Unix variant.” Source: “Choosing a Strategic Systems Architecture,” by Brad Day, Forrester Research, Inc., June 29, 2006. Available for purchase at: www.forrester.com/Research/Document/Excerpt/0,7211,39702,00.html

⁷ Source: Itanium Solutions Alliance

Table 1. Migrating to Itanium®-based Solutions^a

| Current Environment | Challenges with Current Environment | Ease of Migration to Itanium®-based solutions | Benefits |
|------------------------------|---|--|--|
| x-86 | | | |
| Linux®/Windows® Applications | <ul style="list-style-type: none"> ▪ Memory Constraints (32-bit applications) ▪ Scale-up Limitations ▪ Too Many Servers | <ul style="list-style-type: none"> ▪ Packaged Apps: Quick and Easy ▪ 32-bit Custom Apps: Requires 64-bit Migration and Recompilation ▪ 64-bit Custom Apps: Simple Recompile | <ul style="list-style-type: none"> ▪ Better Scale-up Performance (up to 512 processors and 1,000 TB of addressable memory) ▪ Mainframe-class Availability ▪ Reduced Operating Costs (Fewer Servers) |
| UNIX® on RISC | | | |
| Solaris® on SPARC® | <ul style="list-style-type: none"> ▪ Performance Issues ▪ High Operational Costs ▪ High Upgrade Costs ▪ Vendor/OS Lock-in | <ul style="list-style-type: none"> ▪ Packaged and Custom Apps: Relatively Easy Using HP Migration Kits; Migrate to Native Itanium Code If and When Required | <ul style="list-style-type: none"> ▪ Better Performance ▪ Comparable or Better Scalability/Availability ▪ Broad Support, Flexible Options ▪ Lower TCO |
| AIX® on Power® | <ul style="list-style-type: none"> ▪ High Operational Costs ▪ High Upgrade Costs ▪ Vendor/OS Lock-in | <ul style="list-style-type: none"> ▪ Packaged Apps: Medium ▪ Custom Apps: May Require Extensive Code Migration | <ul style="list-style-type: none"> ▪ Comparable or Better Scalability/Availability ▪ Broad Support, Flexible Options ▪ Lower TCO |
| Mainframe | | | |
| IBM z/OS® | <ul style="list-style-type: none"> ▪ High Costs ▪ Vendor Lock-in ▪ Limited Options ▪ Integration Challenges | <ul style="list-style-type: none"> ▪ Extensive Tools and Support Available from Multiple Vendors ▪ Visit the Mainframe Migration Alliance Web site at: http://mainframemigration.org | <ul style="list-style-type: none"> ▪ Mainframe Scalability, Availability, Manageability ▪ Run Legacy Mainframe Applications Alongside Linux and Windows Applications ▪ Greater Flexibility ▪ Lower TCO ▪ Easier Integration |

^a The information in this table provides general guidelines only. Every migration is different, and customers are encouraged to conduct a thorough analysis of costs, risks and benefits before undertaking a complex migration.

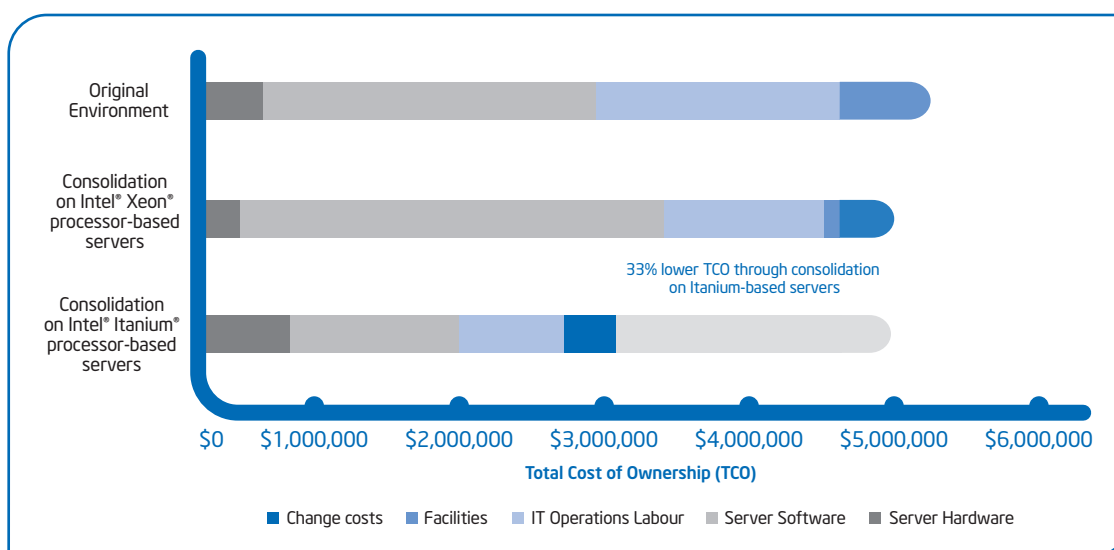


Figure 2. According to a recent report by Alinean, consolidating Microsoft SQL Server® instances on Itanium®-based servers can reduce TCO by 33 percent compared with consolidating on Intel® Xeon® processor-based servers. ([Read the full report.](#))

Better Value for Linux,* Windows,* UNIX,* and Mainframe Applications

“...most of the customers interviewed stated that their business faced barely any disruption in the architecture switch to Itanium...”

— Nathaniel Martinez and Thomas Meyer, IDC⁸

Migration to Itanium® architecture offers substantial benefits for a wide range of business-critical enterprise and technical computing applications. The key is to target migration efforts that will deliver the greatest value for the least cost and risk (Table 1 on previous page). In general, Itanium-based systems are best suited to large, enterprise-class database, data warehousing, and business intelligence applications; for core enterprise applications, such as Enterprise Resource Planning, Supply Chain Management, and Customer Relationship Management; and for demanding technical and scientific applications that are data-intensive and multi-threaded, and that scale most effectively on large, symmetric multiprocessor (SMP) servers.

In all these cases, migrating to Itanium-based systems can often help IT organizations improve performance, scalability, availability, and manageability; consolidate workloads onto fewer servers and processors; and reduce the total cost of ownership. Major software vendors, such as BEA, Oracle, SAP, SAS, and many others have proven tools and methodologies that simplify migration to Itanium-based servers. The following sections focus on scenarios for which migration can be particularly valuable.

Mainframe Migration in Action Bay Area Rapid Transit (BART)

- Transports more than 330,000 riders per day
- Named America's #1 transit system in 2005
- Migration expected to deliver savings of \$40 million

The San Francisco Bay Area Rapid Transit (BART) District needed to modernize its mainframe-based financial, human resources and supply chain applications. After a thorough review of the cultural and technical challenges, the company decided to move to Oracle PeopleSoft Enterprise* running on Itanium®-based HP Integrity* servers. The Oracle solution met most of the company's 2,600 software requirements right out of the box, and according to Robin Cody, BART's Department Manager of Information Technology, *“We like the architecture and future roadmap of HP Integrity servers, Intel Itanium processors, and the HP-UX* 11i operating system. They will provide us with more capacity, scalability, and unlimited growth potential.”*

The first phase of the transition was successfully completed, and is already helping BART streamline operations, simplify data sharing, and provide a more adaptable foundation for the future. Projections show it will help the company save \$20 million over five years. The second phase is underway. Once completed, it is expected to deliver dramatic improvements in inventory turnover, while providing an additional \$20 million in savings over a five-year period.

Read the complete case study at: <http://h71028.www7.hp.com/ERC/downloads/4AA1-0645ENW.pdf>

⁸ Source: IDC White Paper sponsored by HP, “End-Users’ Feedback: Transform IT and Increase Business Performance Through Itanium-based Standardization,” August 2005: www.itaniumsolutions.org/attachment/resource_media/01148F01-BEFD-D4E8-F418FDF3F6A3B1E1.pdf

RISC Migration in Action Lufthansa

- Migrated revenue-critical systems to Itanium®-based servers
- Enhanced revenue optimization across 1,800 daily flights
- Realized fast payback, with reduced capital, operational, and software licensing costs

As a premium airline operating in a tough market, Lufthansa relies on a sophisticated revenue management system to optimize profitability across its 1,800 daily flights. *"The trick is to predict demand and get the best possible price for seats,"* says Dr. Marcus Frenz, VP of IT Management for Lufthansa. To take profitability to the next level, Lufthansa extended its application to enable optimization across each customer's complete itinerary, a move that required a major upgrade in compute power.

To deliver this power cost-effectively, the company deployed its new O&D Optimizer application on a cluster of Itanium-based servers, and then migrated its O&D Forecaster application, as well. According to Arno Kumpf, the Lufthansa project lead, *"...the superior price/performance ratio delivered by the Intel Itanium processor-based HP Integrity Superdome* infrastructure has undoubtedly transformed our revenue management system. The things we're doing today we couldn't even consider doing a few years ago..."* With better information and a company-wide focus on quality and efficiency, Lufthansa is thriving. While the overall aviation industry endured yet another year of loss, Lufthansa increased its revenue 7.5% in 2005, and its passenger numbers continue to swell.

Read the complete Intel case study at: http://cache-www.intel.com/cd/00/00/32/32/323218_323218.pdf

Increasing Performance and Headroom for Linux and Windows Data-tier Applications

"With the Itanium-based platform, our 64-bit business intelligence solutions deliver the accountability and reliability it takes to make critical decisions around more than \$15 billion in annual revenue."

— Joe Matz, General Manager of Microsoft's World Wide Licensing and Pricing organization.⁹

Scaling up existing Linux and Windows applications onto larger and more robust Itanium-based servers is perhaps the simplest migration scenario, and the one that often delivers the greatest benefit with the least cost and risk. Though many applications are best served by the flexibility, affordability and raw performance of Intel Xeon processor-based systems, others will benefit from larger and more robust Itanium-based systems that can handle more users, heavier workloads and multi-terabyte data requirements — all on fewer systems and fewer software images.

Itanium-based systems can also help IT organizations consolidate systems and applications more effectively. This was confirmed in a recent TCO study by Alinean (Figure 2 on page 6). Based on the database environments of two real-world companies, the study showed that consolidating the Microsoft SQL Server* instances on Itanium-based servers would yield, on average, 33 percent better TCO than consolidating on Intel Xeon processor-based servers. (Read the complete white paper at: <http://www.itaniumsolutions.org/files/temp/DA59CA88-D46E-85B2-0BB5975729BE0B02/SQL%20Server%20on%20HP%20Integrity%20-%20TCO%20White%20Paper.pdf>)

Expert support for migration to Itanium-based servers running Windows or Linux is widely available from system, OS, and application vendors, and many tools are available that help to automate data and code migration. No major OS change is

⁹ Read the full Intel case study: "Accelerating Data Delivery: Dual-Core Intel® Itanium® 2 Processor, SQL Server* 2005 Yield 8X Speedup for Microsoft." www.intelalliance.com/microsoft/assets/microsoft_case_study.pdf

required, and many data-tier software vendors support Itanium-based systems. This includes not only primary applications, but many dependent tools and utilities, as well. Interfaces tend to be very similar, and skill sets transfer easily between the two environments. For software components that have not yet been ported to Intel Itanium microarchitecture (and are not performance critical), the IA-32 Execution Layer enables Itanium-based servers to run native IA-32 code.¹⁰

Custom code, and packaged applications with numerous custom scripts, can be more challenging to migrate. If they are 32-bit applications, they will need to be ported to 64-bits. Once this conversion is complete, it is relatively easy to compile and optimize code for either Itanium-based systems or Intel Xeon processor-based systems. (With proper planning, a single code base can be used to support both hardware architectures.) The Intel® Software Network (<http://softwarecommunity.intel.com>) offers comprehensive tools, support, information and training that can simplify these efforts.

Reducing Costs with UNIX on Itanium-based Systems

A number of Itanium-based system vendors support UNIX OS versions on Itanium-based systems. HP, for example, provides extensive tools and support for migrating HP-UX*, NonStop*, Open VMS*, and other UNIX environments onto its Integrity* line of Itanium-based servers. Tools and processes have been refined across thousands of successful customer migrations, so customers can move confidently onto an open, standards-based hardware architecture, while maintaining an identical or very similar operating environment.

According to recent reports from Alinean, HP's Itanium-based solutions provide superior return on investment versus leading RISC/UNIX solutions.¹¹ They also provide very flexible virtualization and partitioning capabilities, so that UNIX, Linux, and Windows applications can be integrated and managed on the same server.

For more information about HP migration services, visit: <http://h20219.www2.hp.com/services/cache/13401-0-0-224-121.html>

Mainframe Migration in Action PGGM

- Second largest pension fund manager in the Netherlands
- Manages a total pension capital of over €80 billion
- Migration reduced annual IT costs by over 40 percent

PGGM's aging mainframe and UNIX* applications were costly to maintain and were making it difficult to share information among applications. More flexible and open solutions were needed, both to improve internal operations, and to enable easier connectivity with employers and business partners outside the organization. To address these challenges, PGGM embarked on an ambitious project to replace its legacy applications and infrastructure with a Microsoft .NET service-oriented architecture (SOA) running on an industry-standard infrastructure.

PGGM chose Itanium®-based HP Integrity* servers for its database platform. According to Hans van der Zwaag, IT operations manager for PGGM, the new Itanium-based servers running Windows* *"give us great performance for memory-intensive databases. Plus, the platform scales beautifully, so we can consolidate other database instances later if necessary."* The company now has a scalable, flexible infrastructure that can evolve easily to meet future needs, and has reduced its annual IT costs by more than 40 percent.

Read the complete case study at: http://h71028.www7.hp.com/ERC/downloads/4AA1-1933EEW.pdf?jumpid=reg_R1002_USEN

¹⁰ Performance is roughly comparable to a similarly clocked Intel Xeon processor-based system, and will rise proportionately with future processor advances. Though performance will vary with applications, expectations are that IA-32 EL performance will be roughly 50 to 70 percent of the performance of native Itanium-based applications.

¹¹ To view the Alinean reports, and other information related to the TCO and ROI advantages of HP's Itanium-based systems, visit the HP web site at: www.hp.com

Standardizing Proprietary UNIX Environments: Windows

"Windows Server 2008 and SQL Server 2008 for Itanium-based systems deliver amazing scalable performance and high levels of reliability¹²."

— Bill Laing, GM, Windows Server & Solutions Division, Microsoft

Companies are migrating away from proprietary UNIX/RISC platforms to reduce hardware and software costs and to provide a more consistent and widely supported operating environment across their infrastructure. Windows is the number one destination of UNIX migrations, and interoperability between UNIX and Windows is far better than most IT organizations realize.¹³ According to recent research from Mercer Management Consulting, *"UNIX customers report that it is often just as easy to migrate to a new platform (e.g., Windows or Linux) as it is to upgrade to new versions of UNIX"*¹⁴.

With the release of Windows Server 2008* for Itanium-based systems, the value of the combined platform took another leap forward. New features, such as *Windows Hardware Error Architecture* and *Dynamic Hardware Partitioning*, enable fault-tolerant computing solutions that have never before been possible in a Windows environment. System health and utilization can be monitored automatically, and critical server components can be added or replaced in running server partitions with no downtime and with no administrative intervention.

Windows skills are already widely represented in most organizations, and new tools and services can simplify migration to Itanium-based systems. For example, Microsoft, MKS and other third-party software vendors provide extensive support for running UNIX applications with little or no change on the Windows operating system, and for managing and extending mixed environments. Applications can then be ported in a phased migration, with very little downtime or disruption.

Visit the Microsoft Web site for more information about:

- Itanium-based servers: www.microsoft.com/servers/64bit/itanium/overview.msp
- UNIX Migration: www.migrationforunix.com

Standardizing Proprietary UNIX Environments: Linux

The openness and affordability of Linux, and its similarity to UNIX, makes Linux on Itanium-based systems a popular target for modernizing legacy UNIX/RISC systems. New virtualization technologies and high availability features included in Itanium-based OS versions from leading vendors are adding to the value. Combined with the scalability, availability and large memory configurations of Itanium-based servers, they provide valuable new options for virtualizing and consolidating heavy workloads and large numbers of applications in the data center.¹⁵

Extensive migration support is available from many sources, including Red Hat, Novell, major Itanium-based hardware and software vendors, service providers, and Gelato.org, an open source community focused specifically on the Linux operating system running on Itanium-based systems. Another important resource is the HP Solaris-to-Linux Porting Kit*, which automates 90 to 95 percent of code migration and enables both UNIX and Linux versions to be supported from the same source code. HP also provides comprehensive support for migration, along with an automated code scanning tool that provides a quick assessment of migration complexity.

For more information about:

- HP migration resources, visit: http://h21007.www2.hp.com/portal/download/files/unprot/Migration_resources_guide_v3.pdf?jumpid=reg_R1002_USEN
- The HP Solaris-to-Linux Porting Guide*, visit: http://h21007.www2.hp.com/portal/download/files/unprot/linux/sol_to_linux_porting_guide.pdf

¹² For more information about Windows Server 2008 visit www.microsoft.com/windowsserver2008/en/us/itanium-high-end.aspx; for more information about SQL Server 2008, visit www.microsoft.com/sqlserver/2008/en/us/white-papers.aspx

¹³ According to a report by Ideas International, "Although UNIX and Windows are fundamentally different operating systems in many ways, interoperability between the two systems did not present major difficulties for the users who had migrated from one to the other, especially when their workloads were based on third-party software that supports multiple platforms." Source: "Migrating Business-Critical Applications from UNIX to Windows and Itanium® 2-based Servers," by Ideas International, January 2006. www.itaniumsolutions.org/attachment/resource_media/6BE0A04B-9D4E-200F-4B071BD5518C7A1D.pdf

¹⁴ Source: "Driving Lower TCO and Rapid ROI through UNIX Migrations," Mercer Management Consulting, May, 2006. www.intelalliance.com/microsoft/assets/mercer-white-paper.pdf

¹⁵ The Virtualization capabilities included in Red Hat Enterprise Linux 5.1 scale to support any number of processors and guest environments, making it an excellent choice for data center consolidation. For more information, see the Itanium Solutions Alliance press release, "Virtualization Capabilities for Itanium®-based Systems Expand with Red Hat Enterprise Linux 5.1." www.itaniumsolutions.org/news/virtualization_capabilities_for_itaniumbased_systems_expand_with_red_hat_enterprise_linux_51

Modernizing Mainframe Environments

An estimated two-thirds of all corporate data reside on mainframes, and there is growing concern among companies that the inflexibility of these systems, along with the cost and risk of maintaining them, is having a negative impact on competitive business capabilities. These concerns are exacerbated by the projected shortage of software developers over the next decade as the generation of experienced COBOL programmers reaches retirement age.¹⁶

The value of migrating legacy mainframe applications to Itanium-based servers was quantified by Alinean in a recent study. Alinean evaluated the costs and benefits realized by a major manufacturing company as a result of migrating its SAP implementation from an IBM mainframe to Itanium-based servers. The report documents annual savings of \$7,680,000 (a 72 percent reduction in operating expenses), with a complete return on investment in just 18 months and 351 percent ROI over a four-year period.¹⁷

Several Itanium-based solution vendors (Fujitsu, HP, Microsoft, PSI, Unisys, and others) are focused on helping organizations support, extend and migrate legacy mainframe systems and applications in ways that modernize the infrastructure while leveraging existing assets. Businesses will take several paths toward modernization, including moving existing code to new platforms, modernizing code through SOA and Web services, replacing legacy code with off-the-shelf applications, and porting code to newer and more broadly supported languages. Itanium-based solution vendors offer support for all these strategies, along with hardware and software platforms that deliver the scalability, availability and manageability of traditional mainframe systems, but with greater flexibility and lower TCO.

Getting Started

“While the proliferation of porting tools makes the process easier, in some cases almost trivial, migrations must be planned as carefully as any other major IT effort.”¹⁸

Taking advantage of the flexibility and affordability of Itanium-based systems begins with three basic steps.

- 1. Assess your environment** to find business-critical, data-intensive enterprise or technical applications that are nearing end of life, due for consolidation, in need of overhaul to address changing business requirements, or are not meeting expectations in terms of performance, scalability, availability, adaptability or cost.
- 2. Determine whether Itanium-based servers (or Intel Xeon processor-based servers) are the best choice for migration.**
 - For particular packaged applications or vertical industries, visit the Itanium® Solutions Alliance (www.itaniumsolutions.org) for a list of key software vendors and for pertinent case studies and white papers.
 - For custom applications, check with your preferred Itanium-based server or OS vendor for support, or with the Itanium® Solutions Alliance (www.itaniumsolutions.org) or Gelato.org.
 - For mainstream business applications that do not require the high-end scalability and availability of Itanium-based servers, explore Intel Xeon processor-based solutions: www.intel.com/products/server/processors.

¹⁶According to Gary Anthes, of ComputerWorld: “The persistence of Cobol—welcome or not—presents a dilemma for many companies. Their legacy code will require significant resources for years to come, yet younger software developers often don’t want to work with Cobol, and in most cases, they’re no longer learning it in school. And while there are thousands of Cobol coders still in the workplace, a large percentage of them are nearing retirement age.” Source: “Cobol Coders: Going, Going, Gone?” by Gary Anthes, ComputerWorld, October 9, 2006. www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=266228

¹⁷Source: Mainframe Migration Case Studies: A Total Cost of Ownership Comparison, by Greg Shanker, Vice President, Alinean. For the full report, see: www.alinean.com/PDFs/Intel-Mainframe_Migration-TCOStudy.pdf

3. Conduct quantitative ROI and TCO analyses, as well as a technical feasibility assessment, for migrating to Itanium-based systems. Compare the cost, complexity, and risk of migrating with the cost, complexity, and risk of upgrading the existing architecture. Consider working with an experienced vendor at this point to simplify and accelerate the process and reduce risk.

- For a high-level overview of best practices that can help to reduce the effort and risk of migration, see Appendix A.

Conclusion

Companies are migrating to Itanium-based solutions to reduce costs, improve performance, scalability, and availability, and provide a more flexible architecture for future growth. Though the risk and complexity of a major migration should never be underestimated, new and emerging tools can greatly simplify and accelerate the move to Itanium-based systems. Even more important is the broad ecosystem of hardware, software, and services that are available to support migrations, new deployments, and ongoing operations. Easy integration with Intel Xeon processor-based servers adds to the advantages, enabling organizations to deploy industry-standard servers across all their application requirements.

More than 75 of the world's 100 largest companies have already deployed major business applications on Itanium-based systems, and adoption continues to accelerate around the globe. Joining the move may be easier than you think, and may help you substantially reduce IT costs, while positioning your business for faster and more efficient growth in the years ahead.

¹⁸ "Itanium 2 Developer Days Diary: Insider Tips and Tricks for Porting Applications to Itanium 2-based Architecture," by Robin Drummond, April 27, 2006. <http://www.ddj.com/hpc-high-performance-computing/187000299?pgno=1>

Appendix A: Best Practices for Migration

The following recommendations are based on a major SAP migration to Itanium-based servers conducted by Intel's own IT organization. For more information, see the IT@Intel white paper, "Migrating Order Management to Itanium®-based Servers." www.sap.com/company/events/pdf/Migrating_Order_Mgmt.pdf.

Note: For major migrations, most organizations will benefit from working with an experienced vendor or service provider.¹⁹ Be sure to select a vendor that offers comprehensive support, a proven track record, and a strong roadmap for Itanium-based products and services.

1. **As legacy systems reach the end of their lifecycle, assess the value of a move to Itanium-based solutions (or to Intel Xeon processor-based servers).** Compare the cost of acquiring new systems on the same architecture to the cost of comparable Itanium-based solutions. Include quantitative TCO and ROI analyses to illuminate the differential costs of hardware, software, migration, maintenance, and support.
2. **Consider the full range of OS options (UNIX, Linux, Windows, z/OS, etc.).** Be aware that migrations are simplest when moving to the same or a similar OS, but may deliver better flexibility and long-term value when moving to a more standards-based and widely supported environment, such as Windows or Linux.
3. **Inventory your existing solution.** Your analysis should include not only primary systems and software but also secondary components, such as runtime environments, drivers, utilities, storage systems, etc. Also consider dependencies with databases, middleware, security, and management infrastructure.
4. **Determine the degree of support for Itanium-based solutions** and identify any gaps that will need to be resolved, as well as training requirements for migrating, maintaining, and using the new solution. If gaps exist, alternative vendors may need to be identified. Alternatively, consider running dependent 32-bit applications on Intel Xeon processor-based servers or on Itanium-based servers using the IA-32 Execution Layer (but be sure to check on vendor support for running in emulation mode).
5. **Assess the quantity and complexity of your custom applications and scripts.**²⁰ Determine if they will need to be ported, or if they can be run without change or with a simple recompile using available software tools. If porting is required, identify appropriate tools and procedures.
6. **Determine test and validation plans.** Define performance metrics that are meaningful in terms of real business results.

¹⁹ As reported by IDC, "End-users can benefit from vendors that can transfer years of experience, know-how and skill with x86 standardization to Itanium servers." Source: IDC White Paper sponsored by HP, "End-Users' Feedback: Transform IT and Increase Business Performance Through Itanium-based Standardization," August 2005: www.itaniumsolutions.org/attachment/resource_media/01148F01-BEFD-D4E8-F418FDF3F6A3B1E1.pdf

²⁰ Consider the use of application portfolio management (APM) and mining tools to simplify this process. According to Forrester, emerging APM tools offer major IT benefits, not only for migration assessments, but for greatly reducing the organizational knowledge loss that makes legacy applications so challenging to maintain. See: "Java, COBOL, And Perl Share A Common Problem," by Phil Murphy with Kimberly Q. Dowling, Forrester Research, Inc., November 11, 2005. Available for purchase at: www.forrester.com/Research/Document/Excerpt/0,7211,38182,00.html

7. **Investigate industry benchmarks for sizing estimates,** and follow up with proof-of-concept testing on realistic workloads. (Look into the Intel® Remote Access and Intel® Early Access programs for accessing state-of-the-art development and test environments.)
8. **Determine uptime requirements for your application(s),** and consider the advanced RAS options of Itanium-based solutions.²¹
9. **Conduct a small pilot deployment to uncover potential challenges.** Load and test applications in stages, beginning with the OS and core applications, then adding infrastructure elements incrementally (virus protection, backup and restore, management, disaster recovery, etc.) This will make it easier to isolate and resolve any issues that arise. Working with a select group of end-users during final testing can help to evaluate training requirements.
10. **Tune your solution to optimize performance and scalability.** Intel offers a suite of software optimization tools that integrate easily into existing development environments and may substantially improve application performance.²²

²¹ For information about the RAS capabilities of Itanium architecture, read the Intel white paper: "Mainframe Reliability on Industry-Standard Servers." www.itaniumsolutions.com/attachment/resource_media/EE4D67DA-047B-1EBD-40A0F631E87BDBF7.pdf

²² For information about Intel Software Development Tools, visit the Intel Web site at: www.intel.com/cd/software/products/asm-na/eng/index.htm

Appendix B: Additional Resources

Extensive resources are available for migrating applications to industry-standard servers, including both Intel Itanium processor and Intel Xeon processor-based systems. The following is a partial list.

Tools for Legacy Software Modernization

Custom code running on proprietary operating systems is especially problematic for large businesses. It is costly to maintain, yet difficult to migrate.^a Although there are no easy solutions, tools and technologies are available that provide relief when used as part of a comprehensive migration strategy.

- Application Portfolio Management (APM)^b tools provide a comprehensive view of application assets.
- Service Oriented Architecture (SOA) technologies simplify the reuse of legacy code in modern environments.

Itanium®-based systems add additional flexibility, due to their multi-OS capabilities (UNIX,* Windows,* Linux,* z/OS,* etc.) and the broad community of vendors targeting various legacy environments.

^a "The labor to maintain custom-developed applications is the bulk of unknown/unexplained expenses in many of Forrester's client companies. Packaged applications see little of this type of maintenance because the company does not possess the source code." Source: "Got Legacy? Four Fates Await Your Applications," by Phil Murphy, Forrester, January 10, 2006. Summary available at: <http://www.forrester.com/Research/Document/Excerpt/0,7211,38097,00.html>

^b "With annual savings reported in the range of 10% to 30% of the IT budget, these [APM] tools are worth serious consideration by any firm with a large percentage of custom-written source code." Source: "Java, COBOL, and Perl Share a Common Problem," by Phil Murphy, Forrester Research, Inc., November 11, 2005. Available for purchase: <http://www.forrester.com/Research/Document/Excerpt/0,7211,38182,00.html>

Products, Services and Support

Microsoft:

UNIX/Migration: www.microsoft.com/windowsserver/compare/compare-windows-to-unix.msp

Mainframe Modernization: <http://microsoft.com/mainframe>

Windows/UNIX Interoperability: <http://technet.microsoft.com/en-us/intermigration/bb380248.aspx>

Windows on Itanium-based Servers: www.microsoft.com/servers/64bit/itanium/overview.msp

Windows Server 2008 for Itanium-Based Systems: www.microsoft.com/windowsserver2008/en-us/itanium-high-end.aspx

Novell:

http://developer.novell.com/wiki/index.php/Porting_and_Migration_Tools

Red Hat:

www.redhat.com/rhel/migrate/linux

Dell (for Intel Xeon processor-based servers only):

<http://dellrisc.ziffdavisenterprise.com>

HP:

Porting and Migration Tools: <http://h21007.www2.hp.com/portal/site/dspp/menuitem.863c3e4cbcdc3f3515b49c108973a801?ciid=80082207fde021102207fde02110275d6e10RCRD>

Migration Services for HP Integrity (Itanium-based) servers: http://h71028.www7.hp.com/ERC/downloads/5982-3184EN.pdf?jumpid=reg_R1002_USEN

HP Migration overview: http://h71028.www7.hp.com/enterprise/cache/562818-0-0-225-121.html?jumpid=hpr_R1002_USEN

Articles and White Papers

"Mainframe Migration Case Studies: A Total Cost of Ownership Comparison," an Alinean White Paper, by Greg Shanker, Managing Vice President, Analyst Group, Alinean.

"Driving Lower TCO and Rapid ROI through Unix Migrations," Mercer Management Consulting, May, 2006: <http://download.microsoft.com/download/E/A/0/EA0F6F0B-BAA2-46B1-9EBC-7F28EFA7C508/MercerWhitePaper%20.pdf>

"UNIX-to-Linux migration: An Introduction," a Red Hat white paper: www.redhat.com/whitepapers/migration/U2L_migration_FINAL.pdf

"Migrating Unix ERP Installations to a Windows Server Environment: A Qualitative Assessment of Business Impact," a META Group white paper: http://download.microsoft.com/download/5/7/f/57f1490e-8a8d-497b-bbae-ec2a44b3799f/META_Group-Migrating_Unix_ERP_Installations.pdf

"Itanium 2 Developer Days Diary": www.ddj.com/187000299?pgno=1

For more papers, articles and case studies, visit the Itanium Solutions Alliance Web site at www.itaniumsolutions.org

[^] 64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Consult with your system vendor for more information.

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